Keep the furnace room apart from the others and provide proper ventilation about the furnaces.

Employ an improved technic for pouring when such is at fault—perhaps some automatic device.

Provide for the removal of all metallic dust and deposits about the foundry by a systematic and thorough cleansing, at regular intervals, of the floor, walls, ceiling, rafters, etc.

Employ strong, healthy men to do the work demanded in brass foundries, zinc smelters, and in any allied trades in which zinc is poured.

Do not employ minors or women.

Do not demand of the workmen an amount of labor that is fatiguing.

Provide proper washing and toilet facilities, and advise the men as to the necessity of their proper use.

Allow the men reasonable time for washing before their eating period and a suitable place for eating.

Caution them to change their clothes before leaving the shop. Advise them not to wear mustaches and to employ respirators when necessary. Caution them against sudden changes in temperature.

A study of industrial diseases is of great importance and should form part of the curriculum of medical schools. With the help of the State, which is now assured in Pennsylvania and in several other commonwealths, it will be possible to inaugurate methods of prevention that will greatly lessen disease and increase the efficiency of the workers.

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# UNILATERAL RENAL HYPOPLASIA AND DYSPLASIA DUE TO DEFECTIVE ARTERIOGENESIS; RELATION TO SO-CALLED HYPOGENETIC NEPHRITIS.[1]

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The facts embraced in this communication are presented in support of a contention that there is a type of renal anomaly of developmental origin which predisposes to or renders inevitable some form of nephritis, and that this congenital abnormality is probably primarily a defective arteriogenesis necessarily early in the evolution of the organ; furthermore, it is thought that some evidence, based on morphology, is here presented for the first time. The material upon which the report is based represents an accumulation of four years. In order to establish the thesis enunciated it is necessary to prove (1) that abnormal kidneys reasonably assignable to such a group occur; (2) that they result from defective arteriogenesis; (3) that they are accompanied by, or lead to, cardiorenal phenomena in at least some degree reasonably attributable to the kidney condition.

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[1] Read at the meeting of the Association of American Physicians, May, 1916.

Kidneys of the type considered have long been known and variously named, and the congenital origin of many fully accepted. Chopart[2] knew that one kidney might be large, the other small. The earlier observers did not differentiate congenital or primary hypoplasia from sclerotic, inflammatory and other forms of secondary contraction, or atrophy. Indeed the term atrophy, frequently used, is not acceptable; it implies wasting. Some of these kidneys have at no time been larger than when found; such are not wasted organs. As applied to these organs the terms rudimentary, fetal and infantile are also of uncertain interpretation. Teyssèdre[3] used the term renal agenesis; hypogenesis is better. Agenesis should mean absence of the organ, often, however, it is used synonymously with hypogenesis.

LePlay and Fayor[4] call the condition renal disparity and observe that it is an arrest and not an atrophy. Evidently Gastaldi[5] has the same thought and terms it inequality of renal volume, and congenital unilateral atrophy; he restricts these names to kidneys in which both vessels and ureters are present. Braasch[6] evidently recognized this type of lesion, which he included under unilateral atrophic kidney and thought it might be congenital or acquired. Cadore[7] and Gerard[8] include relative atrophy obviously meaning abnormal smallness of one kidney and apply the term absolute atrophy to a more marked lesion. Polack[9] describes the condition of agenesis. Many so-called discoid kidneys[10] belong with this group. Some infantile kidneys of the type described by Geraghty and Plaggemeyer[11] should also be included. The organs and clinical phenomena to which Babes[12] applied the term hypogenetic nephritis and the forms studied by Mironescu[13] and by Jianu and Meller[14] have to do with this type of lesion. The condition is recognized by most authors of text-books; kidneys like those constituting the basis of this article are known to, and adequately described by practically all systematic writers; the basis of defective angiogenesis, however, is not presented as the essential factor in their evolution.

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[2] Maladies des Voies Urinaries, Paris, 1830; cited by Gastaldi.

[3] Thèse de Paris, 1892.

[4] Bull. et Mém. de la Soc. Anat. de Paris, 1909, T. 84, 339.

[5] Thèse de Paris, 1910.

[6] Ann. Surg., 1912, lvi, 726.

[7] Thèse de Lille, 1903.

[8] Jour. de l'Anat. et de la Physiol., 1903, 39th year, 176.

[9] Thèse de Bordeaux, 1908.

[10] Fèrè, Bull. de la Soc. Anat. de Paris, 1881, 417; Legueu, Bull. de la Soc. Anat. de Paris, 1892, 19.

[11] Jour. Am. Med. Assn., 1913, lxi, 2224.

[12] La Sem. Med., February 8, 1905; cited by Jianu and Meller.

[13] Beit. zum Studium der Histologie der hypogenetischen Nephritis (rumanisch) Bukarest, 1908; cited by Jianu and Meller.

[14] Centralbl. f. allg. Path. u. path. Anat., September 15, 1912, 774.

These kidneys are hypoplastic or defectively developed organs; often they are more, the internal arrangement of cortex and medulla is quite anomalous (see Figs. 1, 2, 3, 5, 7), a sort of dysplasia or cacoplasia.

MORBID ANATOMY. Although both organs may be involved, hypoplasia is rarely, if ever, bilateral and even where both kidneys are implicated is never truly symmetric; commonly it is restricted to one kidney, the other showing compensatory hypertrophy. Usually the affected organ weighs one-fourth or less, to one-half as much as the other. In five instances I have the weights of both kidneys; the average for the smaller organ is 75.8 gm., and for the larger 140.4; if two cases in which both kidneys are obviously affected be excluded the average weight of the larger kidney becomes 161.3 gms.; the average for the smaller is but little influenced, being 75.4 gms. The most marked difference in weight is 110 gms., the larger weighing in this case 210 gms., the smaller 100 gms. In four cases the smaller kidney weighed 20, 35, 50 and 60 gms. respectively. Teyssèdre[15] observed an instance in which the involved organ weighed 0.85 gm. Gastaldi[16] from computations based on original observation and collated data gives for a man a normal of 152 gms., for left kidney, and 141 gms. for the right.

It is, therefore, obvious that the affected kidney may weigh less than 1 gm. and anything between that and the normal. The whole kidney need not be involved (several kidneys show this, notably the upper in Fig. 5); one pole may be practically normal or at most but little affected. Anomalies of the genitalia[17] usually unilateral and on the side of the hypoplastic kidney, frequently accompany renal anomalies of this type; in case recorded by Lombroso[18] the renal defect was on one side and the genital abnormality on the other. Renal dystopia and misplacements of ovaries or testes have also been noted.

The accompanying reproductions (Figs. 1 to 6 inclusive), from photographs, are, in each instance, one-half normal size and adequately illustrate the gross morbid anatomy. An epitome of known data is included in each legend. I have photographs of all specimens studied; this publication includes a few typical specimens only. With the exception of one pair all the organs are in the Museum of the Jefferson Medical College. As much histologic description as may be necessary to present the vascular changes and their results will be given when discussing defective arteriogenesis.

Of Gastaldi's 66 cases, 10 were females, 32 males and in 18 the sex was not stated. In my series 5 were males, 4 females. Including the 9 cases on which this report is based, 60 cases have been identified in which the kidney involved is known: 32 right, 28 left. Of 9 patients here reported 3 were negroes.

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[15] Loc. cit.

[16] Loc. cit.

[17] Secher, Berl. klin. Wchnschr., 1915, 52d year, 487; Jainu and Meller, Centralbl. f. allg. Path. u. path. Anat., September 15, 1912, 774; Besançon, Thèse de Paris, 1889.

[18] Cited by Winter, Arch. f. klin. Chir., 1903, Bd. lxix, 6111.

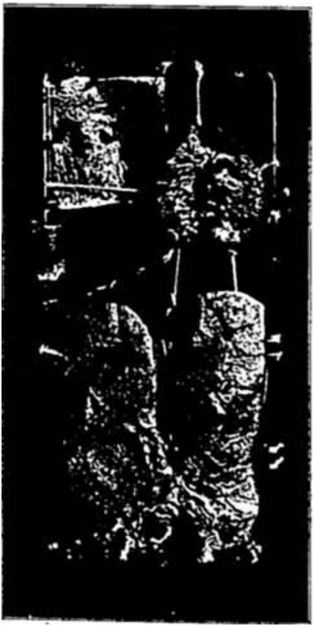

FIG. 1.—Incised surface of kidneys, neither normal; upper organ of infantile type. One-half natural size. M. J.; female; white; aged seventy-three years. Patient and husband insane. Arteriosclerosis; tuberculosis; tuberculous peritonitis. Cardiorenal symptoms (dropsy, stupor, uremia); death. Urine pale: specific gravity, 1010: albumin and casts. Postmortem: Arteriosclerosis. Heart 510 gms. Right kidney (upper) 20 gms. Left kidney (lower) 120 gms. Duplicated renal vessels on both sides. Right kidney of infantile type; vessels nearly obliterated. Distinctions between cortex and medulla imperfect and arrangement abnormal in both organs. Open aorta with abnormal orifices of renal arteries above and to left. See also photograph of other aspect shown in Fig. 2. (Museum No. 1637.)

Concerning the second proposition, namely, that the abnormal kidneys result from defective arteriogenesis, the evidence must be more carefully weighed. The time is past when doubt as to the vascular origin of certain forms of nephritis can be entertained; arteriosclerotic kidney is universally accepted. When, in this condition, one kidney is much more changed than the other, or one renal artery more sclerotic than its mate, or, as is not unknown, when a branch of one renal artery, distributed to one pole of one kidney, is more sclerotic than other branches to other parts of the same kidney, is it not reasonable to assume that some congenital or essential developmental peculiarity has determined the asymmetric distribution of the lesion? The pressure in both arteries must be balanced, the toxicity of the blood, the irritant, destructive or other noxious agents in that fluid must be proffered alike to both arteries and to all branches of the same artery, so that if differences are found the reasonable assumption is that they resulted from peculiarities of the affected vessel. Resting on known facts deduction necessarily

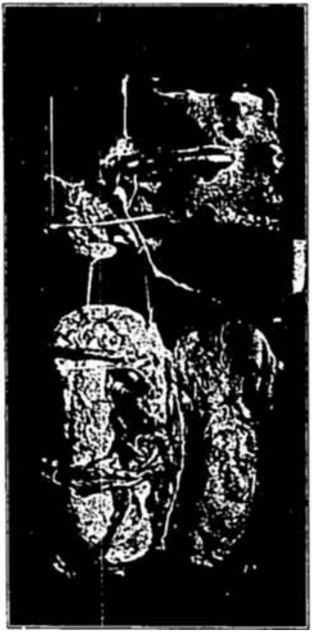

FIG. 2.—One-half natural size. External aspect of opened kidneys shown in Fig. 1. Above and to right external aspect of opened aorta. Smaller kidney supplied by two renal arteries both small and cord-like. Artery to larger kidney came off from aorta as a single trunk dividing at once into two branches both of which are shown on left half of lower organ. Trunks and branches show notable sclerosis superimposed on a congenital anomaly. Clinical data are given in text and in legend to Fig. 1. (Museum No. 1637.)

leads to the conclusion that developmental peculiarity must be a determining factor.

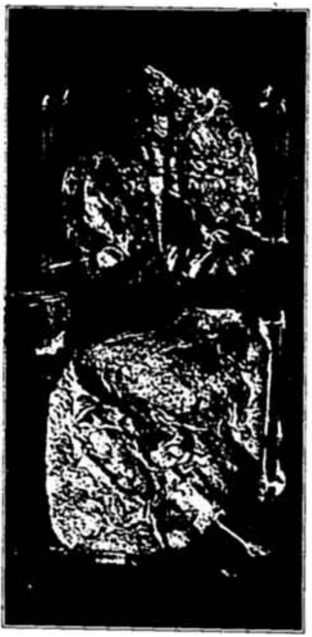

FIG. 3.—Both organs hypoplastic and dysplastic; superimposed alterations of secondarily contracted (arteriosclerotic) kidneys. One-half natural size. Female; colored; aged thirty years. Brought to Hospital in convulsions; unconscious; unequal pupils; urine contained albumin. Coroner's case. Death attributed to septic embolism from infected finger. Postmortem: Pneumonia; pleurisy. Heart weighed 350 gms. No evidence of embolism and no thrombosis found. Moderate arteriosclerosis. Right kidney (upper) 50 gms. Left kidney (lower) 130 gms. Distinction between cortex and medulla possible at points only. (Museum No. 615.)

For about a quarter of a century through succeeding editions, Osler[19] has maintained that some patients have better vessels than others; it is reasonable to believe that in the same patient some arteries may be better than others. Lancereaux[20] clearly recognized a relation between congenital narrowing of the vascular tree and nephritis, observing that in some patients the former is at first accompanied by chlorosis, and later by albuminuria with atrophic sclerous nephritis. Gaucher,[21] Rayer[22] and Besançon,[23] contended for a nephritis due to arterial aplasia. Rayer noted a relation between size of the renal artery and the kidney supplied, and that in

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[19] Principles and Practice of Medicine, 1892, 664; Osler and McCrae, Principles and Practice of Medicine, 1916, 8th ed., 842.

[20] Art. Rein. du Dict. Encyclop. des Sci. Med., 1876, 3me Serie, T. 3, 216.

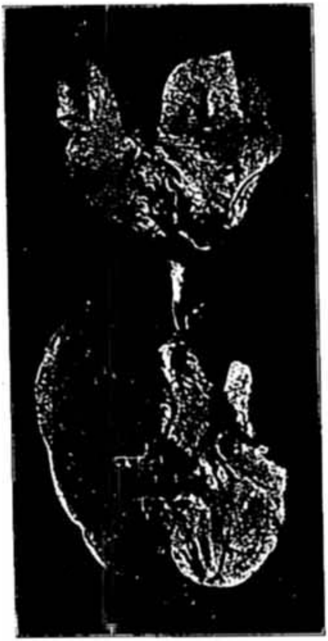

FIG. 4.—Presented through courtesy of Prof. Stengel, Prof. A. J. Smith and Dr. Weidman. One-half natural size. E. H.; female; white; aged twenty-one years. "Always had kidney trouble." In 1912 when six months pregnant, toxemia, albuminuria, miscarriage. January, 1914, therapeutic abortion for toxemia, albuminuria, etc. Blood-pressure known at that time to exceed 212. Recovery with high blood-pressure. Readmitted in August and again in December, 1914. Quantity of urine varied from 750 c.c. to 2825 c.c. Specific gravity, 1007–1010; blood in urine once. Phthalein 33 per cent. in two hours. Wassermann negative. Clinical Diagnosis: Arteriosclerosis; chronic interstitial nephritis. Postmortem: Death due to thrombosis of intestinal vessels. Heart 470 gms. Left kidney (upper) 35 gms. Right kidney (lower) 80 gms. See also text. Sclerotic changes superimposed on congenital anomaly. (Museum No. 2632.)

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[21] Cited by Besançon.

[22] Ibid.

[23] Thèse de Paris, 1889.

the same individual the two arteries as well as the organs supplied differed correspondingly in size; of course, this is known to every morbid anatomist. I am not so sure that Gaucher's allusion to nephritis resulting from primitive alteration of anatomic elements refers to defective bloodvessels as the essential basis. Besançon is perfectly clear; to him a subnormal arterial function exerts a deteriorating influence on the kidney, increases its susceptibility to toxic bodies, and may alone determine a primitive interstitial

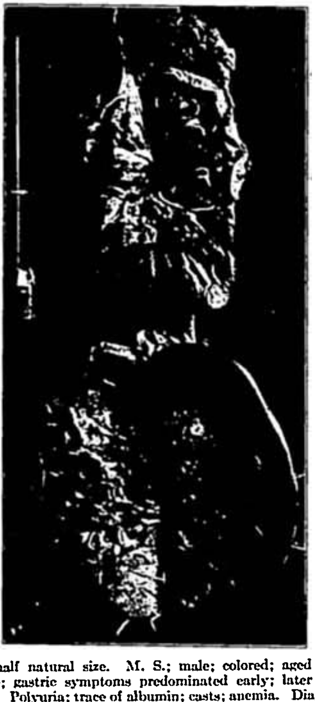

FIG. 5.—One-half natural size. M. S.; male; colored; aged forty-eight years. Cardiorenal case; gastric symptoms predominated early; later dropsy; dyspnea; systolic murmur. Polyuria; trace of albumin; casts; anemia. Diagnosis: Pernicious anemia; syphilis of liver. Postmortem: Hydropericardium; hydrothorax; ascites; gumma of liver. Heart 418 gms. Arteriosclerosis. Left kidney (upper) fused with adrenal, combined weight 132 gms.; 2 arteries, 2 ureters separate to bladder; upper half hypoplastic and dysplastic; small segment of lower pole is practically normal. Right kidney (lower) 198 gms. Slight dysplasia but organ distinctly hypertrophied. (Museum No. 905.)

nephritis. He formulated an accompanying clinical picture. Babes[24] notes that walls of renal arteries may be thicker or thinner than normal and that the musculature is usually hypertrophic. The arterial dysplasia so obvious in some of my specimens is quite characteristic. As stated above my contention is that this is the essential feature; probably all else is secondary. Osteogenesis

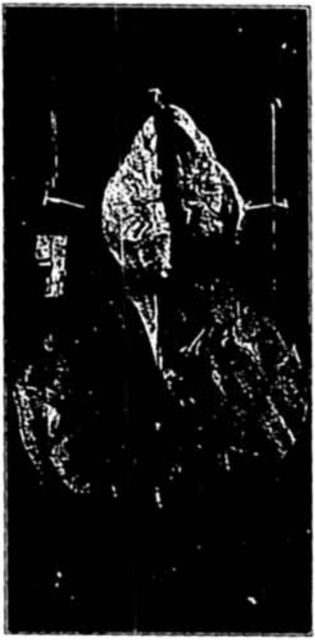

FIG. 6.—One-half natural size. E. D.; female; colored; aged eighty-two years. Had five children; all dead. Disabled by rheumatism. Pain in body and limbs. Edema of legs; ascites; albuminuria; casts; lobar pneumonia; death. Postmortem: Heart 320 gms. Advanced arteriosclerosis. Pneumonia. Left kidney (upper) 110 gms.; hypoplasia and dysplasia; surface but slightly granular. Right kidney (lower) 200 gms. Note absence of normal renal marking; disorderly arrangement of cortex and medulla. Notwithstanding the rather advanced arteriosclerosis neither of these organs is typic of that condition. The larger is clearly hypertrophied, without conspicuous interstitial fibrosis; sections show a degenerative lesion affecting the tubule epithelium with negligible interstitial change; slight glomerular fibrosis. (Museum No. 466.)

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[24] Loc. cit.

imperfecta and neurogenesis imperfecta are both fully recognized; why not, as a basis of many anomalies, a defective arteriogenesis? In some instances veins and possibly capillaries are also implicated—defective angiogenesis.

The organ from which was taken the section depicted in Fig. 7 was removed because of recurring attacks of pain; the case, under the care of Prof. Stewart, will be fully reported elsewhere. The anterior aspect of the kidney showed typic appearance of defective nephrogenesis; the artery figured is from within affected side of organ. Observe fragments of elastica in perivascular tissue, irregular external elastic lamina of uneven thickness and notably deficient in waviness. The muscle is abnormally thick and contains more fibrous tissue than muscle. The internal elastic lamina is nowhere perfect and below shows long irregular sweeps never seen in normal vessels. Fig. 8 is a smaller vessel from the same organ; the muscle layer is thick, the elastic lamina (but one layer is present) is irregular and imperfect; a considerable arc (lower left) is without elastica; between elastica and endothelium is a fibrohyalin stratum resembling the substance observed by Gull and Sutton. Of course the arteries shown are not normal; were they ever so? I doubt it.

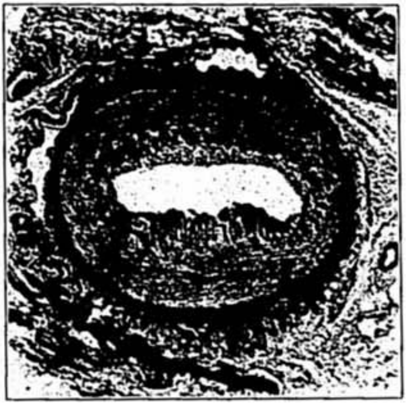

FIG. 7.—Artery supplying involved area of a kidney removed at operation. Fragments of elastica in paravascular tissues; diffuse lime deposit (black) to left and below artery. External elastica almost straight band. Muscle stratum mostly fibrous. Internal elastica atypic, with long sweeping irregular waves notably below. Subintimal proliferation especially marked above. Patient suffered from what was thought to be renal pain or renal angina. Photomicrograph. (Museum No. 2183-B; anterior vessel.)

Fig. 9 (section from organ shown in Fig. 1) shows three arteries, none possessing a lumen proportionate to its size, nor having a normal or vestige of normally distributed elastica; in none is the muscle or intima normal. The organ contained some lime and consequently the section is torn. Below and to the left are groups of hyalin tufts, and a few tubules, two of which are dilated; other tubules containing hyalin are shown near the center. Of course, this patient was old (seventy-three years) and her arteries advancedly sclerotic. The opposite renal artery appeared as sclerotic as those of the small symmetric, miniature or infantile kidney which was probably hypoplastic at birth or became so shortly afterward; the lesions of arteriosclerosis are superposed. Fig. 10 is of artery from upper pole of organ shown in Fig. 5. The distorted cortex, thickened capsule, irregular surface, unevenly distributed medulla, and abnormal pelvis of upper half of organ shown in Fig. 5, might have been attributed to the associated arteriosclerosis; however, the fused adrenal extending into the kidney substance could have had no such origin. The artery shown in Fig. 10 possesses a single irregular imperfect elastic lamina inside of which is a thick muscle layer; fragmentation of intima seen in many of these vessels is

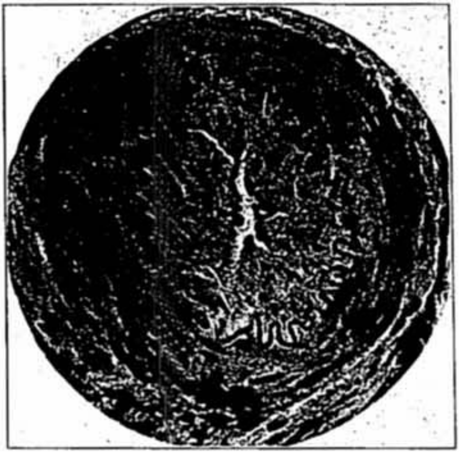

Fig. 8.—Small artery from same case as Fig. 7. Note thick muscle layer; single elastic lamina, imperfect, atypic, and absent from segment below and to the left; break to right; abnormal waviness. Between elastic lamina and slit-like lumen marginated by endothelium note thick fibrohyalin stratum which microchemically gives usual collagen reactions. Arteries from posterior part of this organ did not show these characters or at most but slightly. Photomicrograph. (Museum No. 2183-A; anterior vessel.)

probably due to contained lime salts. I do not believe that this was ever a normal vessel. In Fig. 11 are two vessels in the midst of a mass of fibrohyalin tissue; the stainable elastica is without its characteristic waves, notwithstanding the fact that obviously both vessels are contracted. To the left is part of another vessel, an artery, with the waveless internal elastica upon which is a thin cellular layer covered by endothelium. Fragments of the external elastic lamina extend into the surrounding fibrous cellular tissue. In the center of the picture is a cellular area; below and to the left several imperfectly developed Malpighian tufts Photograph of section from small kidney is shown in Fig. 6.

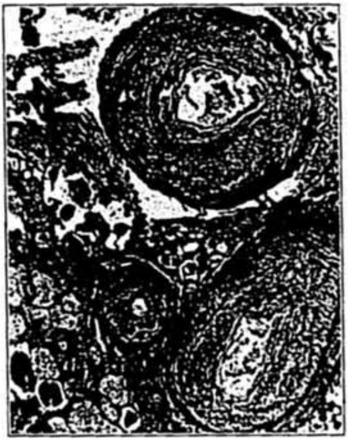

FIG. 9.—Section from kidney shown in Figs. 1 and 2. Three abnormal vessels, apparently arteries. See description in text. Note that normal arrangement of lamina is not present nor are the normal layers recognizable. Below larger vessel note calcified content of degenerated tubules; practical absence of normal epithelium. Below to left many hyalin tufts. Photomicrographs. (Museum No. 1637-8-1.)

The contention is that these kidneys were never perfectly developed, that the arteries were always defective, and that probably the renal hypoplasia rested upon a nutritive basis. Patients may reach an extreme old age without manifesting symptoms, but when anything calls upon the organs for unusual functional activity they break down. Such functional inadequacy is well known in congenital heart disease, in the liver when altered by congenital syphilis, and in allied conditions. Meltzer[25] has shown that in many organs, notably the kidneys,[26] there is a generously beneficent excess of our actual needs. We may by various morbid processes diminish the abundance perilously close to the danger-point. It is equally certain that the patient may be born without the generous supply usually afforded, or, if adequate at birth, faulty or arrested development of the kidney may later exert a crippling influence. It is in such position that these patients find themselves. They may pass through life with no renal manifestation, and in such cases the symptomatology which Besançon[27] and also Jianu and Meller[28] and others have attempted to establish, may be absent. Of 9 cases embraced in this study in 3 renal disease was clearly indicated, and in 1 the diagnosis of chronic interstitial nephritis was made with full recognition of associated cardiovascular phenomena; in another the

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[25] Jour. Am. Med. Assn., 1907, xlviii, 655.

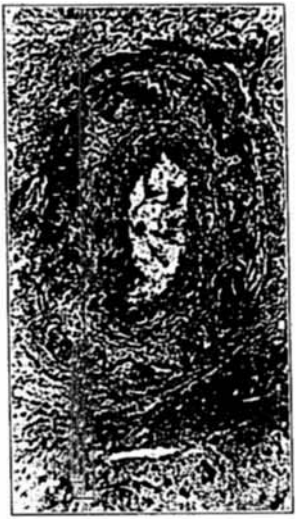

FIG. 10.—Transverse section of artery from upper pole of smaller kidney shown in Fig. 5. Fragments of elastica in paravascular structures; vessel elastica atypic in location and morphology. No muscle external to elastica and abnormally thick fibromuscular stratum between elastica and lumen. Completely detached endothelium. Tissue around vessel is formative in type, contains fibroblasts in varying stages of development. Photomicrograph. (Museum No. 905-3.)

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[26] This phase of renal function is fully discussed by Karsner, Bunker and Grabfield, Jour. Exp. Med., 1915, xxii, 544, who also give references to earlier work.

[27] Loc. cit.

[28] Loc. cit.

diagnosis was chronic nephritis. One of the patients was brought to the accident ward, admitted unconscious with a provisional diagnosis of uremia, and died during transfer to the ward. In this case no doubt a careful study would have resulted in recognition of the condition. One of the patients operated upon (not one of the 3 just mentioned) had been explored and, because the posterior part of the kidney was normal and the anterior alone affected, the condition was not recognized even at operation. The most carefully studied case in the group is the one for which I am indebted to Prof. Stengel.[29] Pregnancy, associated toxemia and eclampsia, with the report that she had had kidney trouble all her life, were suggestive; a systolic pressure above 200 mm., and at one observation 230; a trace of albumin; low specific gravity; phthalein elimination 40 per cent. in two hours; non-protein nitrogen 33 to 36 mgs. per 100 c.c. It is probable that ureteral catheterization might have cleared up the case. Besançon[30] lays particular stress upon history of chlorosis or of a chlorotic appearance, headache, vomiting, lassitude, slightly puffy eyelids, slight diffuse edema of lower extremities, frequent micturition, pale abundant urine; obviously none of these alone, nor all together would constitute anything peculiar or characteristic. Nephritis, toxemia, or uremia,

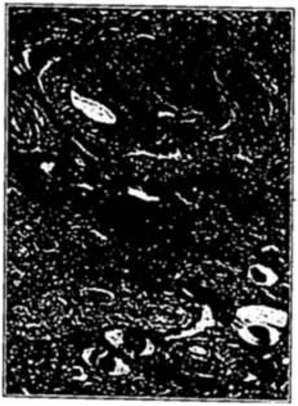

FIG. 11.—Insular fibrosis surrounding small group of imperfectly formed vessels. In center mononuclear infiltration. Below many fibrohyalin glomeruli; others are cellular in centers of dilated tuft spaces. Photomicrograph. (Museum No. 466.)

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[29] Prof. Stengel was kind enough to permit me to examine the clinical history and make the necessary abstract. I am indebted to Prof. Allen J. Smith and Dr. Fred D. Weidman for the privilege of studying the specimen.

[30] Loc. cit.

coming on in young persons without adequate cause should arouse suspicion. Obviously the Roentgen ray and a careful differential study of excretion from the two ureters would be of distinct aid in diagnosis. By the use of these modern methods Dr. Alexander Randall has recognized the condition and has operated upon a patient having renal abnormality apparently of this type. With well-known functional tests at present at the disposal of the clinician it would seem that the condition should be recognized, and that, with a knowledge of the possibility of such an anomaly, a closer scrutiny of atypic cardiorenal cases should result. Because of operative risk incident to attack upon the better kidney the condition must be of particular interest to the surgeon.

# THE RARITY OF CONJUGAL PHTHISIS.

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During fifteen years of service as physician to the United Hebrew Charities of New York City I have had under observation over 800 tuberculous patients annually, most of them married, and a considerable proportion having quite large families. At the beginning of the service, influenced by the current teachings of the dangers of exposure, every consort of a tuberculous patient was suspected of having contracted the disease. The least indication of trouble pointing to the respiratory tract was sufficient to suggest phthisis, and a diagnosis of this disease was made more often than was justified by the subsequent observation of the cases. But with increasing experience among this class of patients I became convinced that tuberculosis in both husband and wife is exceedingly rare, and I drifted to the other extreme—the fact that a woman has a husband with active phthisis would not influence me in interpreting doubtful symptoms and signs in favor of making a diagnosis of this disease because of the exposure to infection to which she has been subjected.

An investigation three years ago[1] showed that the children of these dependent consumptives are infected with tuberculosis to the extent of 84 per cent. when they reach the age of fourteen. The consorts of these tuberculous patients have been found almost invariably "reactors." Bearing in mind that while a positive reaction to tuberculin is conclusive evidence that the person has been infected with tubercle bacilli at some previous period of his or her life, but it by no means shows that the patient is sick as a result

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[1] Fishberg, A Study of the Child in the Tuberculous Milieu, Arch. Pediat., 1914, xxxi, 96, 197; 1915, xxxii, 20.